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(56) Documents cited  
**GB 1132443 A EP 0152259 A**

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**INT CL<sup>6</sup> F16L 29/00**

(54) **Method to assemble a conduit while isolating the interior from the ambient**

(57) A method is provided to assemble a conduit, comprising sealing the interiors of a first conduit section 1 and a second conduit section 2 from the exteriors thereof. Said step of sealing the interiors includes connecting a first sealing member 6 to an end (4) of the first conduit section 1 and connecting a second sealing member 12 to an end (10) of the second conduit section 2, at least part 16, 18 of said sealing members 6, 12 being detachable from said ends by the application of a suitable force in said first or second conduit section, and said at least part 16, 18 of the sealing members 6, 12 being removable through the interior of the conduit. Thereafter, the conduit sections are connected at said ends to each other in a leaktight manner, and said suitable force is applied thereby detaching said at least part 16, 18 of the sealing members 6, 12 from said ends.

**FIG. 2**

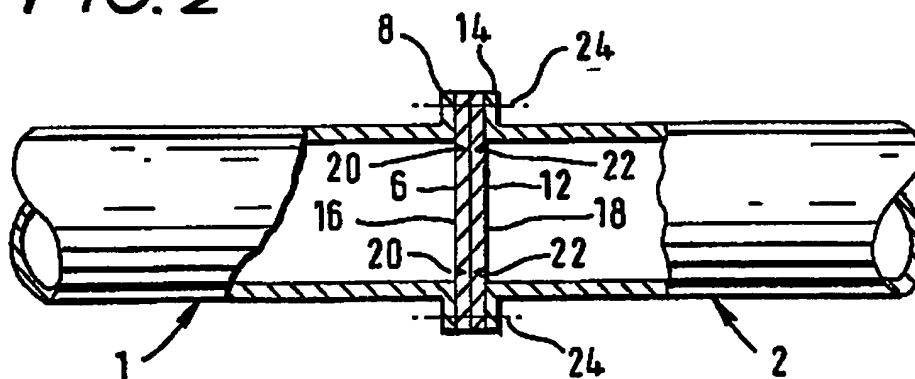


FIG. 1

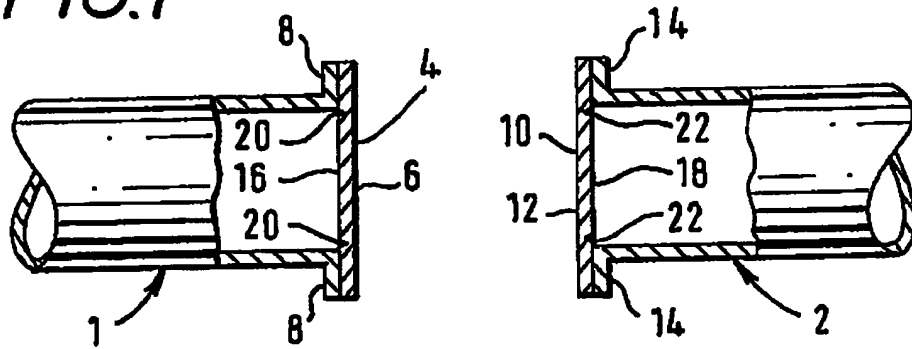


FIG. 2

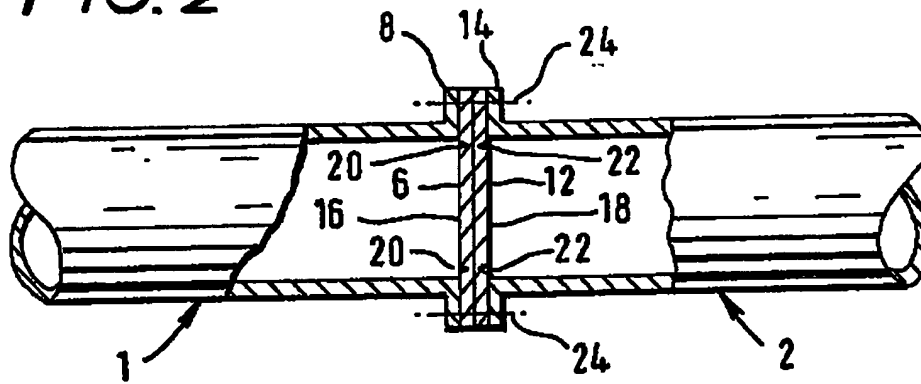
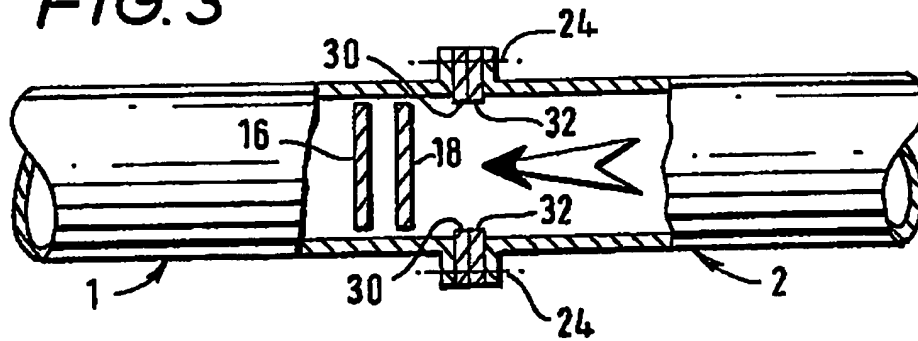


FIG. 3



## METHOD TO ASSEMBLE A CONDUIT

5 The invention relates to a method to assemble a conduit from at least two conduit sections. When during assembling of a conduit the interior thereof becomes internally contaminated, for example with soil or water, it can be required that the contaminations have to be removed from the interior before the conduit is made operational. Depending on the characteristics of the conduit, for example the size, the location, or the type of fluid to be transported, removing such contaminations may involve a costly procedure. When, for example, seawater has entered the interior of an offshore conduit for the transportation of oil or gas, a complete drying procedure may be required before the conduit is made operational. One method to prevent ingress of seawater into the interior of an offshore conduit at a point where two sections are to be connected to each other, or where repair of the conduit is required, consists of arranging a dry habitat in the form of a hyperbaric chamber around the conduit. It is inherent to such a method and to other conventional methods for assembling conduits from separate sections, that complex and costly procedures are involved.

20 It is an object of the invention to provide a simple and reliable method to assemble a conduit from separate sections, in a manner that contamination of the interior of the conduit is prevented, and which method overcomes the disadvantages of the conventional methods.

25 According to the invention there is provided a method to assemble a conduit, comprising sealing the interiors of a first conduit section and a second conduit section from the exteriors of said sections, which step of sealing said interiors includes connecting a first sealing member to an end of the first conduit section and connecting a second sealing member to an end of the second conduit section, at least part of said sealing members being

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detachable from said ends by the application of a suitable force in said first or second conduit section, and said at least part of the sealing members being removable through the interior of the conduit, thereafter connecting said conduit sections at said ends to each other in a leaktight manner, and applying said suitable force thereby detaching said at least part of the sealing members from said ends. By sealing the interiors of the conduit sections before connecting said sections to each other, it is prevented that material such as soil or water enters the conduit when the sections are installed and connected to each other. The sealing members, or part thereof, are detached after connecting up a required number of conduit sections by applying the suitable force, whereafter they can be removed through the interior of the conduit. In case of an offshore conduit, sealing of the interiors of the conduit sections takes place prior to installation on the seabed. The sealing members prevent ingress of seawater so that the presence of a dry habitat at the connections is not required.

Advantageously said suitable force is applied by applying a suitable pressure in the first or second conduit section.

The step of sealing the interiors of the conduit sections suitably comprises connecting a first end cap having a central part forming the first sealing member to said end of the first conduit section, and connecting a second end cap having a central part forming the second sealing member to said end of the second conduit section, which central parts are detachable from said end caps by the application of said suitable pressure. The end caps can be connected to the conduit sections using any suitable connecting means, for example a screwed connection, welded connection or flanged connection.

In a preferred embodiment of the method according to the invention, each end cap has a reduced breaking strength along the circumference of the central part thereof, and said central part is detached from the end cap by breakage of the end cap along said circumference upon application of the suitable pressure. Thus, the sealing member forms an integral part of the end cap before application of said pressure.

The invention will now be described in more detail by way of example, with reference to the accompanying drawings, in which:

Fig. 1 shows schematically two conduit sections which are to be assembled with the method according to the invention to form a conduit;

Fig. 2 shows the conduit sections of Fig. 1 connected to each other; and

Fig. 3 shows the conduit sections of Fig. 1 during removal of the sealing members through the interior of the conduit.

In Fig. 1 are shown two offshore conduit sections in the form of a first pipeline section 1 and a second pipeline section 2 aligned with the first section 1, both sections to be installed on the seabed (not shown). The interiors of both sections 1,2 are sealed, whereby the first pipeline section 1 is sealed at the end 4 by means of a first blind flange 6 connected in a leaktight manner to a flange connection 8 provided at said end 4, and the second pipeline section 2 is sealed at the end 10 by means of a second blind flange 12 connected in a leaktight manner to a flange connection 14 provided at said end 10.

Each blind flange 6,12 has a central part 16,18 of diameter substantially equal to the inner diameter of the sections 1,2, which central part is surrounded by a circular groove 20,22 at the inner side of the flange 6,12. The groove 20,22 serves to reduce the strength of the blind flange 6,12 along the circumference of the central part 16,18 thereof. The reduced strength allows the blind flange 6,12 to break along said circumference upon application of a predetermined pressure in the first pipeline section 1 or the second pipeline section 2.

As shown in Fig. 2, the pipeline sections 1,2 are connected to each other at said ends 4,10 by means of a plurality of bolts 24 which protrude through holes (not shown) provided in the flange connections 8,14 and in the blind flanges 6,12. The bolts 24 are remotely operated thereby connecting the first pipeline section 1 and the second pipeline section 2 to each other in a leaktight manner.

After connecting the pipeline sections 1,2 to each other the pressure in the interior of the second pipeline section 2 is increased until said predetermined pressure is reached, whereupon each blind flange 6,12 breaks along the circumference of the central part 16,18 thereof. Thus, a pipeline 26 is formed from the sections 1,2.

As shown in Fig. 3, the parts 16,18 can be removed through the interior of the pipeline 26 to an outlet thereof (not shown), for example by means of a tool (not shown) which is pumped through the pipeline 26.

In order to ensure that the internal diameter of remaining parts 30,32 of the blind flanges 16,18 is equal to the overall internal diameter of the pipeline 26, a trimming tool (not shown) can be induced to move through the pipeline 26 in order to trim said remaining parts 30,32 to a diameter substantially equally to said overall internal diameter.

Alternatively, the sealing members can be removed from the conduit by making said members of a material which dissolves in a fluid which is induced to flow through the pipeline.

The above detailed description relates to assembling a pipeline from separate pipeline sections. Other applications include, for example, subsea tie-ins of pipes to risers or to subsea equipment.

Instead of applying end caps having a flat shape, such as the flat blind flanges shown in Figs. 1-3, end caps having a slightly outwardly bulged shape can be applied, wherein the convex side of such end caps is at the outside of the conduit sections. When such conduit sections are connected to each other, e.g. by means of bolts, the outwardly bulging end caps become pressed against each other. As the pressure between the end caps increases, flattening of these end caps occurs so that any water therebetween is driven out. It will be appreciated that one of the design parameters of such bulged end caps is the compressive pressure which develops between the end caps as the sections are interconnected.

Various modifications may be made to the method as described hereinbefore. Such modifications are intended to fall within the scope of the appended claims.

C L A I M S

1. A method to assemble a conduit, comprising sealing the interiors of a first conduit section and a second conduit section from the exteriors of said sections, which step of sealing said interiors includes connecting a first sealing member to an end of  
5 the first conduit section and connecting a second sealing member to an end of the second conduit section, at least part of said sealing members being detachable from said ends by the application of a suitable force in said first or second conduit section, and said at least part of the sealing members being removable through the  
10 interior of the conduit, thereafter connecting said conduit sections at said ends to each other in a leaktight manner, and applying said suitable force thereby detaching said at least part of the sealing members from said ends.
2. The method of claim 1, wherein said suitable force is applied  
15 by applying a suitable pressure in the first or second conduit section.
3. The method of claim 2, wherein the step of sealing said interiors comprises connecting a first end cap having a central part forming the first sealing member to said end of the first  
20 conduit section, and connecting a second end cap having a central part forming the second sealing member to said end of the second conduit section, which central parts are detachable from said end caps by the application of said suitable pressure.
4. The method of claim 3, wherein each end cap has a reduced  
25 breaking strength along the circumference of the central part thereof, and wherein said central part is detached from the end cap by breakage of the end cap along said circumference upon application of said suitable pressure.
5. The method of claim 4, wherein said reduced breaking strength  
30 is obtained by providing a groove in the end cap at a side thereof and along said circumference.



6. The method of any one of claims 1-5, wherein after detaching the sealing members a pumpable tool is pumped through the conduit so as to remove said sealing members from the conduit.
7. The method of any one of claims 4-6, wherein after detaching  
5 the central part from each end cap, a trimming tool is induced to move through the conduit so as trim a remaining part of the end cap to a predetermined internal diameter.
8. The method of any one of claims 3-7, wherein said end caps  
10 form blind flanges and said ends of the conduit sections are provided with flange connections, and the step of connecting said end caps to said ends comprises connecting the blind flanges to the flange connections.
9. The method of claim 8, wherein said conduit sections are  
15 connected to each other by remotely operating a plurality of bolts protruding through said flange connections.
10. The method of any one of claims 1-9, wherein said conduit  
forms an offshore conduit whereby the conduit sections are immersed in a body of water during the steps of connecting the conduit sections and applying said suitable force.
- 20 11. The method substantially as described hereinbefore with reference to the drawings.

**Patents Act 1977**

**Examiner's report to the Comptroller under  
Section 17 (The Search Report)**

-8-

Application number

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**Relevant Technical fields**

(i) UK Cl (Edition K) F2G G2A G2B G2J G2Z G18

(ii) Int CL (Edition 5) F16L 29/00

Search Examiner

R J DOWNING

**Databases (see over)**

(i) UK Patent Office

(ii)

Date of Search

2 SEPTEMBER 1992

Documents considered relevant following a search in respect of claims

1-11

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 1132443 (PROJECTEURS) see especially page 1 lines 70-79 and Figures 1 and 5	1, 3
X	EP 0152259 A2 (LUCAS) see the whole document	1, 2

Category	Identity of document and relevant passages	Relevance to claim(s)

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